remarkable discoveries in science during the last decade." This object he attains. His style is clear and straightforward, and, without being "sensational," he knows how to present facts and principles in a way that is likely to arrest attention and awaken curiosity. Among the subjects dealt with are the formation of dew, the colour of water, dust and fogs, lightning, sun-spots, after-glows, the enumeration of organisms in air, micro-organisms in water, and characteristics of deep-sea fishes. The first edition was issued about two years ago. In the present edition the author has added a few notes to bring the facts up to date.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

County Councils and Technical Education.

YOUR article of April 30 (vol. xliii. p. 602) is scarcely fair to the London County Council.

When you allege that the Council "*have 'grabbed' a fund, ear-marked for educational purposes*," you assume the question at issue. The only way in which the fund in question is "ear-marked" for educational purposes is by a clause in the Act which gives each Council a discretionary power to apply the fund either to those purposes or to other purposes, as they choose.

London, which, as proved by Mr. Goschen, is exceptionally rated, has come badly off in the general scramble for Imperial doles which are devoted to the alleviation of rates; and if the representatives of London ratepayers treat this additional dole out of the beer and spirit duties as a make-up for their comparatively small share of other doles, they are doing not only what the law allows, but what equity justifies.

I believe, however, that amongst those who voted against the plan proposed by the Committee of the Council there are many who would not be unwilling to see the money devoted to education, if any well-considered and reasonable plan were proposed for this purpose.

But there are several questions which have to be answered before this can be done properly.

What do the promoters of "technical education" mean by that term? It is not to be the teaching of the elementary school; it is not to be the training of the workshop; but between these two extremes all is uncertain. The counties say, "instruction in the elements of farming"; the London County Council Committee says, "Polytechnics"; the statute says, "whatever the authorities at South Kensington define it to be." Educational reformers generally, so far as I can judge, mean by it all or any forms of secondary education, *i.e.* of the education which carries forward the work of the elementary school, and brings the pupil nearer to the business of life. But we need to be a good deal more precise before we establish a precedent and a practice.

Then, again, is it wise for the London County Council, which has work enough on its hands in looking after the physical condition of this great City, to take upon itself a task for which it is in no way fitted, and which was not contemplated when it was elected? Is it wise to muddle administration by first intrusting one part of education to one elective body—viz. the School Board—and then intrusting another part of it to a different elective body chosen for a different purpose?

Whilst such questions as these remain unanswered, the London Council exercises a wise discretion in not committing itself to any scheme for appropriating this fund, the offspring of a legislative fluke, to any special and permanent object.

You speak, as persons in general speak, of the London County Council as one amongst other County Councils. The name County Council is a misnomer which leads to constant errors. The London County Council has little or nothing in common with the bodies which have taken the place of the old magistracy in most districts. It is really the chief Town Council of the largest city or aggregation of cities in the world, and the rules and reasoning which, under the ill-drawn and ill-digested Local Government Act, are applied to both, are often singularly inappropriate. Calling London a county is the parent of endless mistakes; and to abuse the London Council because it is not acting in the same way as the Councils of counties seem disposed to act is no less confused than unfair. T. H. FARRER.

May 5.

The Alpine Flora.

I HAD not intended to continue the discussion on this subject, but Prof. Henslow's last letter calls for a few remarks. My argument, summed up, is as follows:—

(1) Alpine plants as a class show certain characters, *e.g.* dwarfing and compact growth.

(2) These characters are advantageous to them, or are correlated with such as are advantageous.

(3) Although dwarfing, &c., may be produced as the direct result of environment (*e.g.* poor soil), there is normal variability in respect to size, time of maturing, &c.

(4) When in cultivation those plants are selected which show a natural tendency to dwarfing, &c., it is found that the character is inherited; and in this way, dwarfed, early-maturing, and other peculiar races can be produced.

(5) On the other hand, when plants have been dwarfed from growing in poor soil, or otherwise as the result of environment acting directly upon them, there *appears* to be no evidence to show that the peculiarity is inherited.

(6) Supposing natural selection to be the only factor, it is fully competent, working on the normal variability, to produce the results observed, *so far as they are hereditary*. At least, so it seems to me.

To illustrate the point, take *Mertensia* again. In Colorado, *M. sibirica* grows in ravines, &c., by creeks; it could not possibly grow in the same way above timber-line, with its tall stems and abundant foliage. Yet it gains much advantage in the creek-bottoms from its height and rank growth; if it were a dwarf, it would be almost or altogether smothered. Above timber-line, on the Sangre de Cristo Range, I found the dwarf species, *M. lanceolata.* Thus we have two species frequenting different situations in the same district: each is fitted for its station; either, removed to the station of the other, could not exist. In Arctic regions, *M. sibirica* has produced a dwarf variety called *drummondii*, which is, I suppose, a first step towards the establishment of a dwarf Arctic species.

Prof. Henslow asks why, if natural selection eliminates tall plants on Alpine summits, it does not also do so lower down? I am not at all clear that it does not, in some cases. For example, why is it that plants growing on exposed sea-shores have a tendency to lie upon the ground or otherwise to evade the violence of the winds? But when a plant is growing among others, it has to compete with them in raising itself into conspicuousness, and any slight disadvantage from exposure to the winds would be more than compensated by the advantage of being able to spread its flowers and foliage in the sunlight and attract insects.

The only plant of any size I found above timber-line on the Sangre de Cristo Range was *Cnicus eriocephalus*, a wonderful great thistle, with bright chrome-yellow flowers, which are visited by humble-bees. But this plant is very prickly and woolly, and its heads are nodding; it is, though it seems paradoxical to say so, a gigantic dwarf.

The splendid *Primula parryi* shows its crimson flowers by creeks at very high altitudes in Colorado; an allied but *very small* species lives above timber-line in the same districts, called *P. angustifolia.* These are true species; *angustifolia* is not starved or frozen *parryi*. Now *P. parryi* is coming into cultivation, it would be interesting to see whether it could be modified by environment in the direction of *angustifolia*, and how far such modification would be inherited.

There are other matters one might discuss, but I think I have already written enough. I merely ask, will Prof. Henslow give a case in which the direct effect of environment *has* produced inherited dwarfing? Will he also show that natural selection cannot produce a dwarfed variety, or that artificial selection has not? T. D. A. COCKERELL.

3 Fairfax Road, Bedford Park, Chiswick, W., April 27.

MR. THISELTON-DYER, in his interesting letter in NATURE (p. 581), does not mention one of the striking characteristics of the Alpine flora—the remarkable brilliancy of the flowers, as compared with those borne by the same or similar species in

©1891 Nature Publishing Group

England. A comparison of this kind made by the memory is no doubt not severely scientific, but those tourists in Switzerland who are in the habit of observing flowers will probably confirm the statement. Plants grown at high levels in the Alps are, as Mr. Dyer says, above a great screen of aqueous vapour, and I have in my own mind always put down the greater brilliance of Alpine flowers to their getting more sun than in our cloudier climate. It is not, however, solely any alteration in the actual effects of the solar rays, caused by this absence of aqueous vapour, that makes the colours of Swiss flowers so bright. The same, or, I should assert from memory, even greater, brilliancy, will be found in Arctic and sub-Arctic Norway by anyone who visits the Throndhjem district and the coast to Hammerfest in June. Western Norway notoriously is one of the moistest parts of Europe; but, on the other hand, it has, broadly speaking, no night at midsummer. It is thus apparently the quantity, and not the quality, of the sunlight that causes the peculiarly vivid colours of Swiss flowers, including those of the pastures from 2000 feet upwards. I have never been in Switzerland in spring, and I cannot therefore judge whether the colours of the flora in the lower districts are also more brilliant than ours; but it will be seen below that Swiss observers find that the high Alpine flora is much more brilliant than the same plants in the lowlands.

Our great national garden at Kew is peculiarly badly situated for the growth of Alpines. The situation is low and foggy, and mild muggy weather alternates with night frosts. Above all, the smoke pall of London is peculiarly destructive in connection with the other disadvantages of the site. Alpine plants, as Mr. Dyer shows, are, in their natural state, at rest under a cloak of snow during the winter. The least warmth, however, starts them into growth, and the marvellously rapid flowering of many kinds in the ooze on the melting of a snow-bed, is one of the most curious sights of the Alps. The Kew climate (and the general English one too, though to a lesser degree) keeps the plants in growth in winter. Then fogs, smoke, and damp collect on the young growth. These enemies are peculiarly liable to attach themselves to the numerous sorts with hairy or woolly leaves. Then follow night frosts, and the young growth perishes.

The application of these remarks is, that it does not follow that, because cold frames are necessities in the culture of Alpines at Kew, they should be used elsewhere in England. There has been a long discussion recently on this very point in the gardening papers, and the general belief appears to be, that given a fairly dry climate cold frames are *injurious*, because they excite and keep plants in growth when they should be at rest. A sheet of glass suspended over a plant in the open air, so as to shoot off our superfluous rain and to keep off some of our fog, appears to be much better, for premature growth is not stimulated. Alpines should so far as practicable be kept as dry as we can in winter, by drainage, light soil, &c. Then when growth commences, say in March, they should be well watered each day (unless it is raining), early in the morning. The plentiful moisture thus supplied to some degree takes the place of the melting snow, and it has dried off before the evening frosts seize upon the leaves. The plants thus can grow freely in the day because they are surrounded with a moist atmosphere, and they are kept "stocky" (in gardeners' phrase) by the cold at night, just as they are in fact on the Alps. This is the plan recommended by that great authority M. H. Correvon, of the Jardin Alpin d'Acclimatation, Geneva. In the drier climate of that city, M. Correvon replaces the snow blanket of the Alps by pine boughs fastened closely over his Alpines. In England this would, I fear, only make the plants rot. It does not follow that, because many plants in frames at Kew grow long and straggling and lose their natural habit, they do so in England generally in the open air. The changes in the habits of Alpines are largely due to changes in soil. For instance, the Edelweiss (*Gnaphalium leontopodium*) grows perfectly freely from seed anywhere about London, but the flowers lose their compactness. I am told, however, that if plenty of lime is added to the soil they become as compact and close as in Switzerland.

In "Les Plantes des Alpes" (Geneva, Jules-Carey) M. Correvon very fully explains his views, formed, after great practical experience, on the conditions of the Alpine flora. Your space will not allow me to make many quotations from a work of the utmost interest both theoretical and practical, but the following bears on my point as to the brilliant colours of Alpine flowers:—

"Ces végétaux sont 'reine Kinder des Lichtes,' comme les a appelés un poète allemand; on ne trouve pas de champignons dans les Alpes, ni aucune plante qui n'appartienne franchement au domaine de la lumière. Aussi les espèces de nos plaines qui se trouvent transportés là-haut sont-elles parées de couleur bien plus vives, bien plus pures qu'elles ne sont chez nous."

M. Correvon gives a number of instances in support of this, which I will not quote here. In conclusion, is Mr. Dyer correct in thinking that the soil in the high Alps is permanently frozen with the exception of a slight film on the top? I am aware that when you get to considerable elevations the subsoil is frozen. For instance, I was told that the reason for the well-known mortuary on the Great St. Bernard was that bodies could not be buried there. But a great many of the flowers generally called Alpines grow below the tree limit of 6000 or 6500 feet, and few are to be found above 8000 feet. If the subsoil on the higher Alps is frozen, it would not apparently be so where trees grow, and it would be interesting to know the line of subterranean frost, and at what depths below the surface it is permanent at various elevations. J. INNES ROGERS.

Chislehurst, April 27.

Co-adaptation.

I DO not propose to extend the discussion on this subject beyond the present communication, but I cannot refrain from calling attention to the remarkable discrepancy in the position taken by Dr. Romanes in his last letter (April 23, p. 582), and that in his former communication (March 26, p. 489), in which he says:—"I do not . . . hold myself responsible for enunciating Mr. Herbert Spencer's argument, which the quotation sets forth. I merely reproduced it from him as an argument which appeared to me valid on the side of 'use inheritance.' For not only did Darwin himself invoke the aid of such inheritance in regard to this identical case . . . &c." If words have any meaning, this implies that Dr. Romanes agrees with Darwin in regarding this case as one in which "use inheritance" played a part. Now, after I have endeavoured to show that this supposed case of co-adaptation can be explained without the aid of "use inheritance" at all, Dr. Romanes says that there is no difference of opinion on this point between us. I can only say that I am very glad to learn this admission on his part, but why did he quote the argument from Herbert Spencer as "valid on the side of 'use inheritance,'" if he did not believe it to be a case of true co-adaptation? R. MELDOLA.

High and Low Level Meteorological Observatories.

I HAVE read with much interest your article of the 11th inst. on the results obtained by simultaneous observations in the meteorological observatories at the base and at the summit of Ben Nevis. Ben Nevis rises to a height of only 4370 feet above the sea, and yet we find that the comparison of these observations gives results of a kind that could not be obtained from any number of stations all on the same level. Might we not hope for still more valuable results from similar observatories placed at the base and the summit of Etna and Teneriffe? Etna is 10,870 feet high, and Teneriffe 12,200. These would be better than any Alpine stations, because of their perfect isolation.

Belfast, April 25. JOSEPH JOHN MURPHY.

An "International Society."

AN institution with the grandiloquent title of "The International Society of Literature, Science, and Art," which appears now to be largely touting for subscriptions, publishes in its prospectus a list of the "Honorary Council," among whom appears "Professor Flower." As I am the only person in this country to whom such a description could be applicable, and as many of my friends have inquired of me whether I have really given my support to the institution, I wrote to the secretary to inquire by what authority the name appeared, and received the following reply, which needs no comment:—

"Sir,—We beg to acknowledge the receipt of your favour of Saturday. The gentleman to whom you refer is the well-known Professor Ogilby Flower, of New York. I am sorry the coincidence should have caused you any annoyance. In future printings of our prospectus the Christian name shall be inserted, so that no misunderstanding may exist."

Although this letter was dated March 9 last, I find that the prospectus continues to be issued unchanged, otherwise I should not have cared to trouble you with what may appear a small personal matter. I may mention that there are other names upon the list which present as great or even greater difficulties of identification. W. H. FLOWER.

British Museum (Natural History), May 2, 1891.

©1891 Nature Publishing Group